February 4, 2005

Ms. Kyle Cunningham
Public Center for Environmental Health
City of San Antonio - Metro Health
2513 Kennedy Circle
San Antonio, TX 78235

RE: Sub-Slab Soil Vapor Monitoring

Dear Ms. Cunningham:

Zephyr Environmental Corporation (Zephyr) performed sub-slab soil vapor monitoring operations at four (4) locations in San Antonio, Texas on October 27 and 28, 2004. The purpose of this monitoring was to investigate the possibility that volatile organic compounds (VOCs) are present at levels that could potentially result in vapor migration into indoor air space. The results of the monitoring operations are detailed in attachments to this letter:

- Attachment A contains a detailed summary of Zephyr's monitoring operations
- Attachment B contains copies of Zephyr's field check lists
- Attachment C contains photographs of the sampling activity
- Attachment D contains a summary of laboratory results, the laboratory report of analysis for samples collected and a copy of the chain of custody
- Attachment E contains the Monitoring Locations Map
- Attachment F contains output from the Johnson & Ettinger Model (Version SG-ADV-031403)

Zephyr closely followed its January 2003 Soil Vapor Monitoring and Evaluation Work Plan (which incorporated USEPA guidance) for the proper collection of sub-slab soil vapors.

Summary of Results

The laboratory analyses for all samples collected revealed very low or non-detectable concentrations of constituents of concern, including benzene and various chlorinated solvents. Particularly reassuring is the fact that vinyl chloride was not detected at very low detection limits (generally 1 ppbv or 2.6µg/m^3). Vinyl chloride is often a daughter product resultant from the decomposition of chlorinated solvents and is both highly toxic and mobile in environmental media (e.g., soil and groundwater).

As a risk screening exercise, Zephyr used the reported concentrations for benzene to calculate incremental carcinogenic risks for each sample using the Johnson & Ettinger model. Benzene is very often a "risk driver" due to the fact that it is a carcinogen that is highly mobile in environmental media. Benzene at very low levels (generally below 10 ppbv) was detected in each sample, so the measured concentration was used to calculate the incremental carcinogenic risk at each sampling location. Using default settings in the model to model risk, each sample yielded an excess lifetime cancer risk much lower than the EPA threshold of "one in a million" or 1 x 10^{-6}. In fact, calculated risk levels were one thousand times lower than this threshold, generally in the range of 1 x 10^{-9}.

Conclusions

The absence of detectable concentrations of vinyl chloride suggests that no appreciable anaerobic decomposition of chlorinated solvents is currently occurring in these locations, suggesting that this potentially problematic exposure pathway is not complete. Based on the analytical results for each sampling location, and the subsequent risk modeling that was performed, there does not appear to be an unacceptable human health risk from the volatilization of subsurface contaminants proximate to the sampling locations.

We appreciate the opportunity to perform this project for you. Please call me at 512-329-5544 if you have any questions or comments about this report or the information contained herein.

Sincerely,
Zephyr Environmental Corporation

Joe Zupan, P.E.
Principal

Attachments

ATTACHMENT A
Summary of Monitoring Operations

On October 27 and 28, 2004, Zephyr conducted soil vapor monitoring operations at four locations on or around former Kelly Air Force Base. Soil gas samples were collected by:

- drilling ½-inch holes (approximately 9 inches in depth) through each slab in selected locations
- over-drilling each hole using a ¾-inch drill bit
- inserting a 3/8-inch outside diameter by 6-inch Teflon probe with ¼-inch tubing into the hole
- connecting the tubing to a flow regulator (set at 30 minutes) and a negative pressure SUMMA canister
- applying wet commercial grade "QUIKRETE Concrete Patcher" as a seal around the sample probe
- opening the SUMMA canister valve
- recording the SUMMA canister pressure
- allowing the SUMMA canister pressure to achieve approximately (-)2 psi
- recording the final SUMMA canister pressure
- closing the sample valve
- removing the sample train
- placing the brass cap on the canister valve
- completing label and COC for transport to laboratory
- patching the hole with "Quikrete Concrete Patcher"
- decontaminating the drill bits
- cleaning up the area
- mobilizing to the next sample location

The following summarizes the activities of the sampling at each boring location. In addition, Attachment B provides copies of field checklists, Attachment C provides photographs of the sampling operations, and Attachment D provides a spreadsheet summary of the laboratory results, a copy of the Chain of Custody, and Laboratory results provided by Accutest Laboratories in Dayton New Jersey.

Building 3870

Building 3870 is located at the intersection of N. Tayman Street and Frederick Elgin Street on Former East Kelly, Latitude (southwest corner of Bldg. 3187) 29°22'42.9" N and Longitude 98°32'51.1" W. Sampling was conducted on October 27, 2004. Three sub-slab samples were collected using the procedures referenced above. The slab was approximately 70 feet in length, 45 feet 6 inches in width, and 9 inches thick.

Sample 3870-1 was taken approximately 5 feet 10 inches from the south wall and 10 inches from the west wall of the center room of the building. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 12:27 pm to 1:12 pm. The sampling set-up was removed and the hole was sealed with the patching compound.

Sample 3870-2 was taken approximately 13 feet 4 inches from the east wall and 6 inches from the north wall of the center room of the building. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to

the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 12:34 pm to 1:34 pm. The sampling set-up was removed and the hole was sealed with the patching compound.

Sample 3870-3 was taken approximately 7 feet 10 inches from the south wall and 6 inches from the east wall of the center room of the building. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 12:40 pm to 1:22 pm. The sampling set-up was removed and the hole was sealed with the patching compound.

Building 3060

Building 3060 is located at the intersection of N. Tayman Street and Fickel Street on Former East Kelly, Latitude (southwest corner of Bldg. 3060) 29°22'51.3" N and Longitude 98°32'49.9" W. Sampling was conducted on October 27, 2004. Three sub-slab samples were collected using the procedures referenced above. The slab was approximately 505 feet in length, 244 feet in width, and 9 inches thick.

Sample 3060-1 was taken approximately 110 feet from the west wall and 50 feet from the wall of the offices located on the south end of the building. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 2:19 pm to 3:07 pm. The sampling set-up was removed and the hole was sealed with the patching compound.

Sample 3060-2 was taken approximately 110 feet from the west wall and 172 feet from the wall of the offices located on the south end of the building. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 2:30 pm to 3:20 pm. The sampling set-up was removed and the hole was sealed with the patching compound.

Sample 3060-3 was taken approximately 110 feet from the west wall and 252 feet from the wall of the offices located on the south end of the building. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 2:42 pm to 3:40 pm. The sampling set-up was removed and the hole was sealed with the patching compound.

Building 3830

Building 3830 is located at 3830 Carswell Street on Former East Kelly, Latitude (southwest corner of Bldg. 3060) 29°22'16.5" N and Longitude 98°32'39.6" W. Sampling was conducted on October 28, 2004. Three sub-slab samples were collected using the procedures referenced above. The outside portion of the slab was approximately 390 feet in length, 185 feet in width, and 9 inches thick.

Sample 3830-1 was taken approximately 92 feet from the south edge and 290 feet from the east edge of the slab. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 8:30 am to 9:13 am. The sampling set-up was removed and the hole was sealed with the patching compound.

Sample 3830-2 was taken approximately 92 feet from the south edge 213 feet from the east edge of the slab. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 8:43 am to 9:25 am. The sampling set-up was removed and the hole was sealed with the patching compound.

Sample 3830-3 was taken approximately 79 feet from the south edge and 70 feet from the east edge of the slab. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 8:590 am to 9:38 am. The sampling set-up was removed and the hole was sealed with the patching compound.

Building 700

Building 700 is located at 700 Culberson Street at the Normoyle Park Community Center, Latitude (southwest corner of Bldg. 700) 29°22’50.9” N and Longitude 98°32’22.7” W. Sampling was conducted on October 28, 2004. Three sub-slab samples were collected using the procedures referenced above. The original portion of the slab was approximately 120 feet in length, 40 feet in width, and 9 inches thick.

Two holes were drilled approximately 6 inches north of the wall of the dance room on the south side of the building. The 13-inch drill bit would not penetrate the slab and it was discovered that this was the original south edge of the slab. The holes were patched and sampling was conducted toward the middle portion of what was reported to be the original slab.

Sample 700-1 was taken approximately 20 feet 7 inches from the south wall and 20 feet from the west wall of the main assembly room. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 10:51 am to 12:17 am. The sampling set-up was removed and the hole was sealed with the patching compound.

Sample 700-2 was taken approximately 2 feet from the north wall and 20 feet from the west wall of the main assembly room. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 11:03 am to 11:48 am. The sampling set-up was removed and the hole was sealed with the patching compound.

Sample 700-3 was taken approximately 2 feet from the west wall and 13 feet 5 inches from the north wall of the arts and crafts room. The sample probe was inserted immediately upon removal of the drill bit. The probe, which was connected to the tubing and canister prior to insertion, was inserted approximately 6 inches into the hole and sealed with patching compound. Sampling was conducted from 11:11 am to 11:55 am. The sampling set-up was removed and the hole was sealed with the patching compound.

All samples were shipped to Accutest Laboratories in Dayton, New Jersey and analyzed for VOCs using EPA Method TO-15. A summary of results and a copy of the Chain of Custody can be found in Attachment D.

ATTACHMENT B
COPIES OF FIELD CHECKLISTS AND NOTES

SUB-SLAB SOIL GAS SAMPLING CHECKLIST

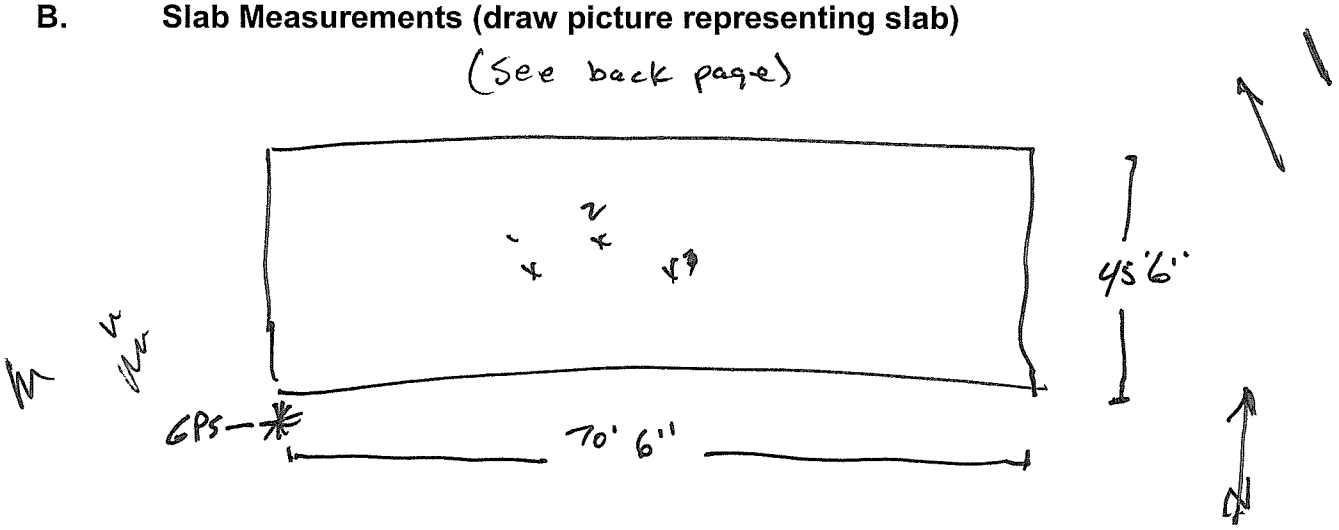
ADDRESS: 3187 N. Tayman **DATE:** 10/27/04

CHECKLIST COMPLETED BY: B. Watson

A. GPS Coordinates N 29° 22' 42.9"
W 098° 32' 51.1"

B. Slab Measurements (draw picture representing slab)

(See back page)



C. Sampling Event	N/A	Yes	No
1. Subsurface utilities identified?		✓	
2. TO-15 SUMMA canister with pressure gauge and flow controller connected to sample probe?		✓	
3. Hole drilled in slab?		✓	
4. Over drilled so that soil gas probe can be sealed?		✓	
5. Sample probe inserted into boring?		✓	

SUB-SLAB SOIL GAS SAMPLING CHECKLIST

	N/A	Yes	No
6. Sample probe inserted into soil beneath the slab? (probe should not be inserted into soil for initial sample)			✓
7. Clay/putty seal placed around the sample probe immediately?		✓	
8. Valve on TO-15 SUMMA canister with flow controller opened?		✓	
9. Canister pressure recorded?		✓	
10. Sample valve closed at the end of sampling event?		✓	
11. Final canister pressure recorded at the end of sampling event?		✓	
12. Samples properly labeled?		✓	
13. ¼ " brass screw-on cap installed to TO-15 SUMMA canister?		✓	
14. Filled canister placed into proper shipping container?		✓	
15. Sampling probe removed from boring?		✓	
16. Boring properly grouted?		✓	

SUB-SLAB SOIL GAS SAMPLING CHECKLIST

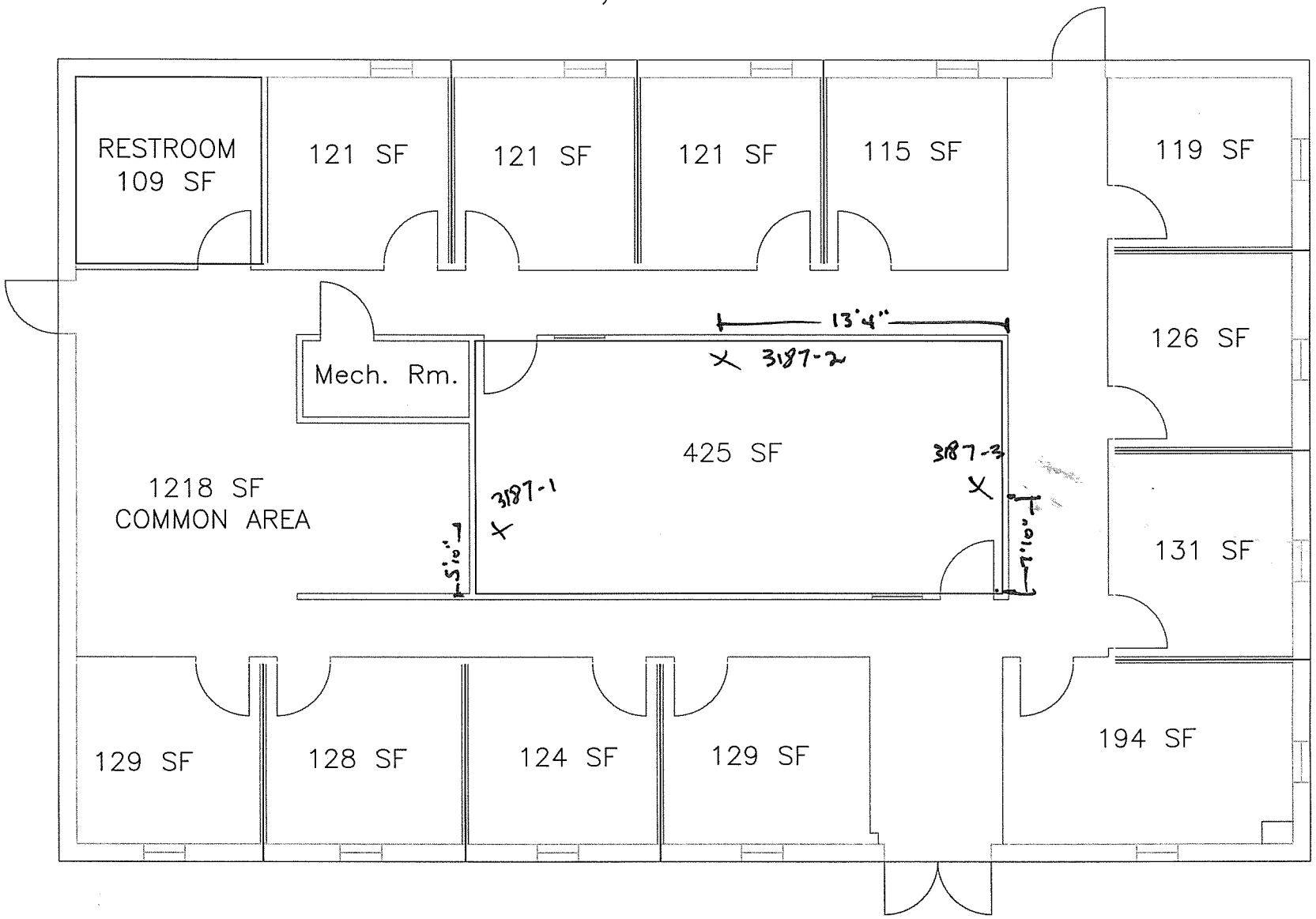
NOTES:

Slab app 9" thick.

Photos of:

- **Site setting**
- **Sampling location**
- **Sampling activities (each step)**
- **All sampling equipment (each step)**

BLDG 3187
3,200 SF



SUB-SLAB SOIL GAS SAMPLING CHECKLIST

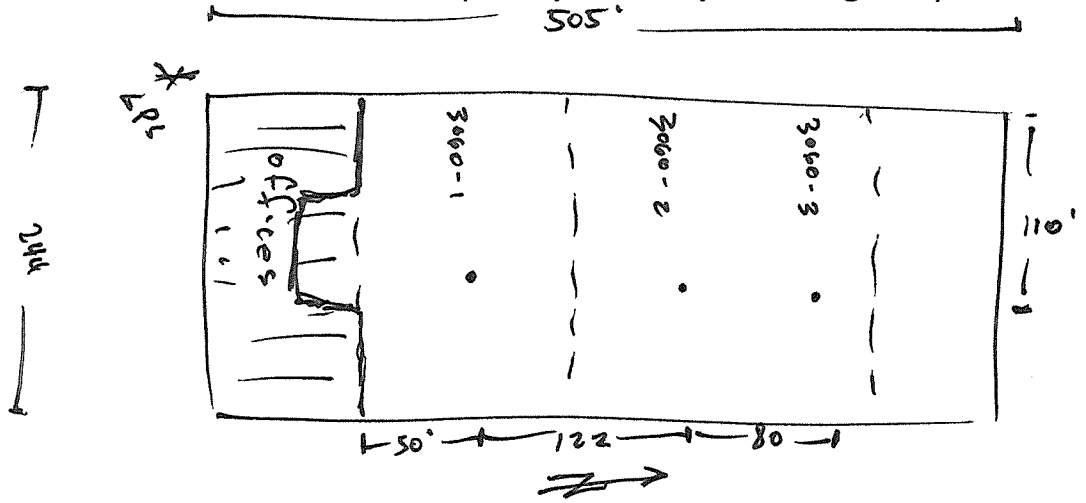
ADDRESS: 3060 Fickel St **DATE:** 10/27/04

CHECKLIST COMPLETED BY: B. Watson

A. GPS Coordinates

N 29° 22' 51.3"
W 098° 32' 49.9"

B. Slab Measurements (draw picture representing slab)



C. Sampling Event	N/A	Yes	No
1. Subsurface utilities identified?		✓	
2. TO-15 SUMMA canister with pressure gauge and flow controller connected to sample probe?		✓	
3. Hole drilled in slab?		✓	
4. Over drilled so that soil gas probe can be sealed?		✓	
5. Sample probe inserted into boring?		✓	

SUB-SLAB SOIL GAS SAMPLING CHECKLIST

	N/A	Yes	No
6. Sample probe inserted into soil beneath the slab? (probe should not be inserted into soil for initial sample)			✓
7. Clay/putty seal placed around the sample probe immediately?		✓	
8. Valve on TO-15 SUMMA canister with flow controller opened?		✓	
9. Canister pressure recorded?		✓	
10. Sample valve closed at the end of sampling event?		✓	
11. Final canister pressure recorded at the end of sampling event?		✓	
12. Samples properly labeled?		✓	
13. ¼ " brass screw-on cap installed to TO-15 SUMMA canister?		✓	
14. Filled canister placed into proper shipping container?		✓	
15. Sampling probe removed from boring?		✓	
16. Boring properly grouted?		✓	

SUB-SLAB SOIL GAS SAMPLING CHECKLIST

NOTES:

Slab app 12" thick

87°F w S/SE 5mph

Cloudy to partly sunny

- Slab is in sections

Photos of:

- **Site setting**
- **Sampling location**
- **Sampling activities (each step)**
- **All sampling equipment (each step)**

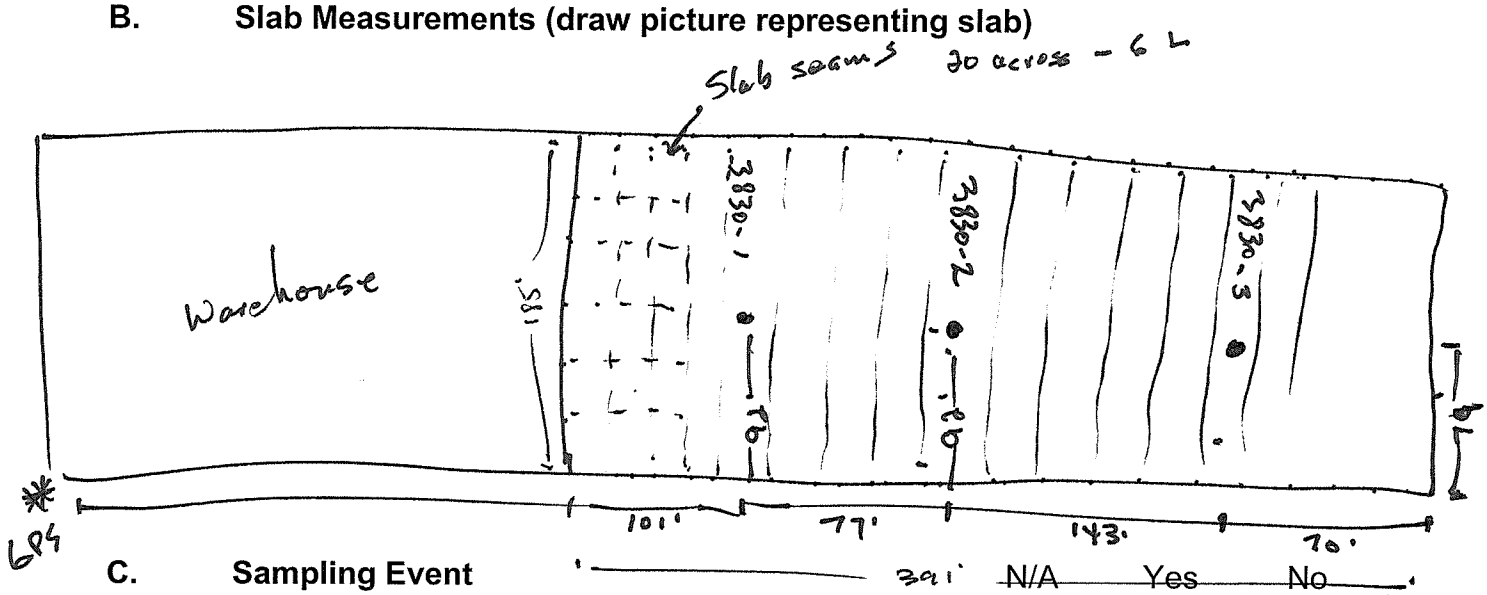
SUB-SLAB SOIL GAS SAMPLING CHECKLIST

ADDRESS: 3830 Causeway ST **DATE:** 10/28/04

CHECKLIST COMPLETED BY: B. Watson

A. GPS Coordinates N 29° 22' 16.5"
W 098° 32' 39.6"

B. Slab Measurements (draw picture representing slab)



C. Sampling Event

	N/A	Yes	No
1. Subsurface utilities identified?		✓	
2. TO-15 SUMMA canister with pressure gauge and flow controller connected to sample probe?		✓	
3. Hole drilled in slab?		✓	
4. Over drilled so that soil gas probe can be sealed?		✓	
5. Sample probe inserted into boring?		✓	

SUB-SLAB SOIL GAS SAMPLING CHECKLIST

	N/A	Yes	No
6. Sample probe inserted into soil beneath the slab? (probe should not be inserted into soil for initial sample)			✓
7. Clay/putty seal placed around the sample probe immediately?		✓	
8. Valve on TO-15 SUMMA canister with flow controller opened?		✓	
9. Canister pressure recorded?		✓	
10. Sample valve closed at the end of sampling event?		✓	
11. Final canister pressure recorded at the end of sampling event?		✓	
12. Samples properly labeled?		✓	
13. ¼ " brass screw-on cap installed to TO-15 SUMMA canister?		✓	
14. Filled canister placed into proper shipping container?		✓	
15. Sampling probe removed from boring?		✓	
16. Boring properly grouted?		✓	

SUB-SLAB SOIL GAS SAMPLING CHECKLIST

NOTES:

Slab app 9" thick

78°F W S/SE 5-7mph

Cloudy

- Slab has hairline fractures in various locations.
- Area where sample collected - No fractures in immediate area within 10'

Photos of:

- **Site setting**
- **Sampling location**
- **Sampling activities (each step)**
- **All sampling equipment (each step)**

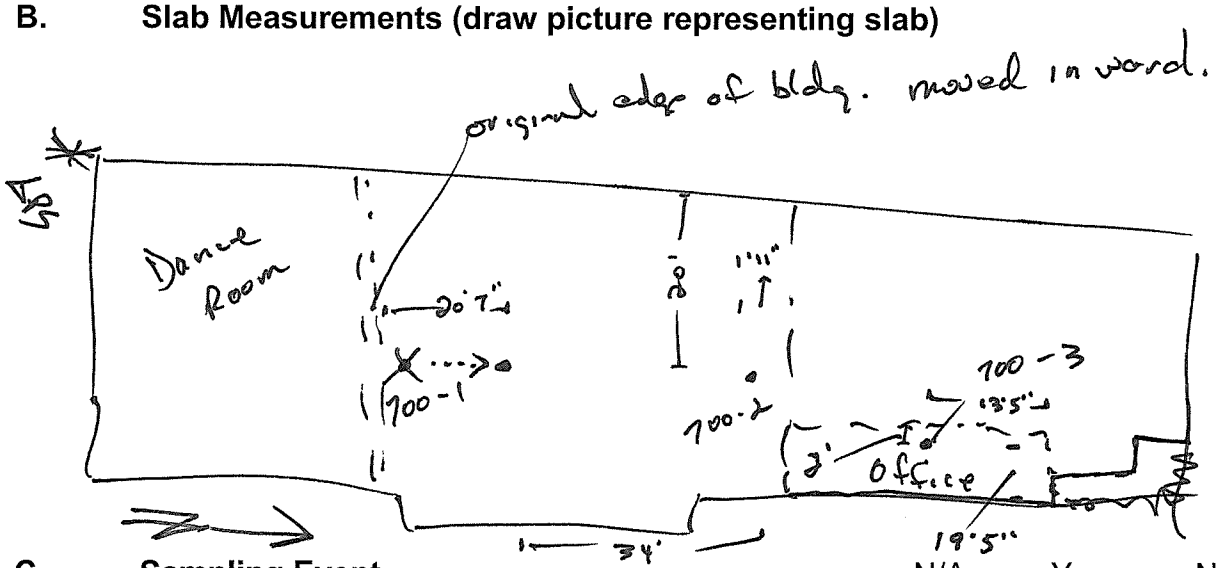
SUB-SLAB SOIL GAS SAMPLING CHECKLIST

ADDRESS: 700 Culberson **DATE:** 10/28/04

CHECKLIST COMPLETED BY: B. Webb

A. GPS Coordinates N 29° 22' 50.9"
W 098° 32' 22.7"

B. Slab Measurements (draw picture representing slab)



C. Sampling Event	N/A	Yes	No
1. Subsurface utilities identified?		✓	
2. TO-15 SUMMA canister with pressure gauge and flow controller connected to sample probe?		✓	
3. Hole drilled in slab?		✓	
4. Over drilled so that soil gas probe can be sealed?		✓	
5. Sample probe inserted into boring?		✓	

SUB-SLAB SOIL GAS SAMPLING CHECKLIST

	N/A	Yes	No
6. Sample probe inserted into soil beneath the slab? (probe should not be inserted into soil for initial sample)			✓
7. Clay/putty seal placed around the sample probe immediately?		✓	
8. Valve on TO-15 SUMMA canister with flow controller opened?		✓	
9. Canister pressure recorded?		✓	
10. Sample valve closed at the end of sampling event?		✓	
11. Final canister pressure recorded at the end of sampling event?		✓	
12. Samples properly labeled?		✓	
13. ¼ " brass screw-on cap installed to TO-15 SUMMA canister?		✓	
14. Filled canister placed into proper shipping container?		✓	
15. Sampling probe removed from boring?		✓	
16. Boring properly grouted?		✓	

SUB-SLAB SOIL GAS SAMPLING CHECKLIST

NOTES:

Slab appr 9" thick

85°F S/SE @ 5-7 mph

partly cloudy.

Photos of:

- **Site setting**
- **Sampling location**
- **Sampling activities (each step)**
- **All sampling equipment (each step)**

ATTACHMENT C
PHOTOGRAPHS OF SAMPLING OPERATIONS

Photo 1 – Drilling hole for Sample 3187-1.

Photo 2 – Inserting probe and sealing with concrete patching compound.

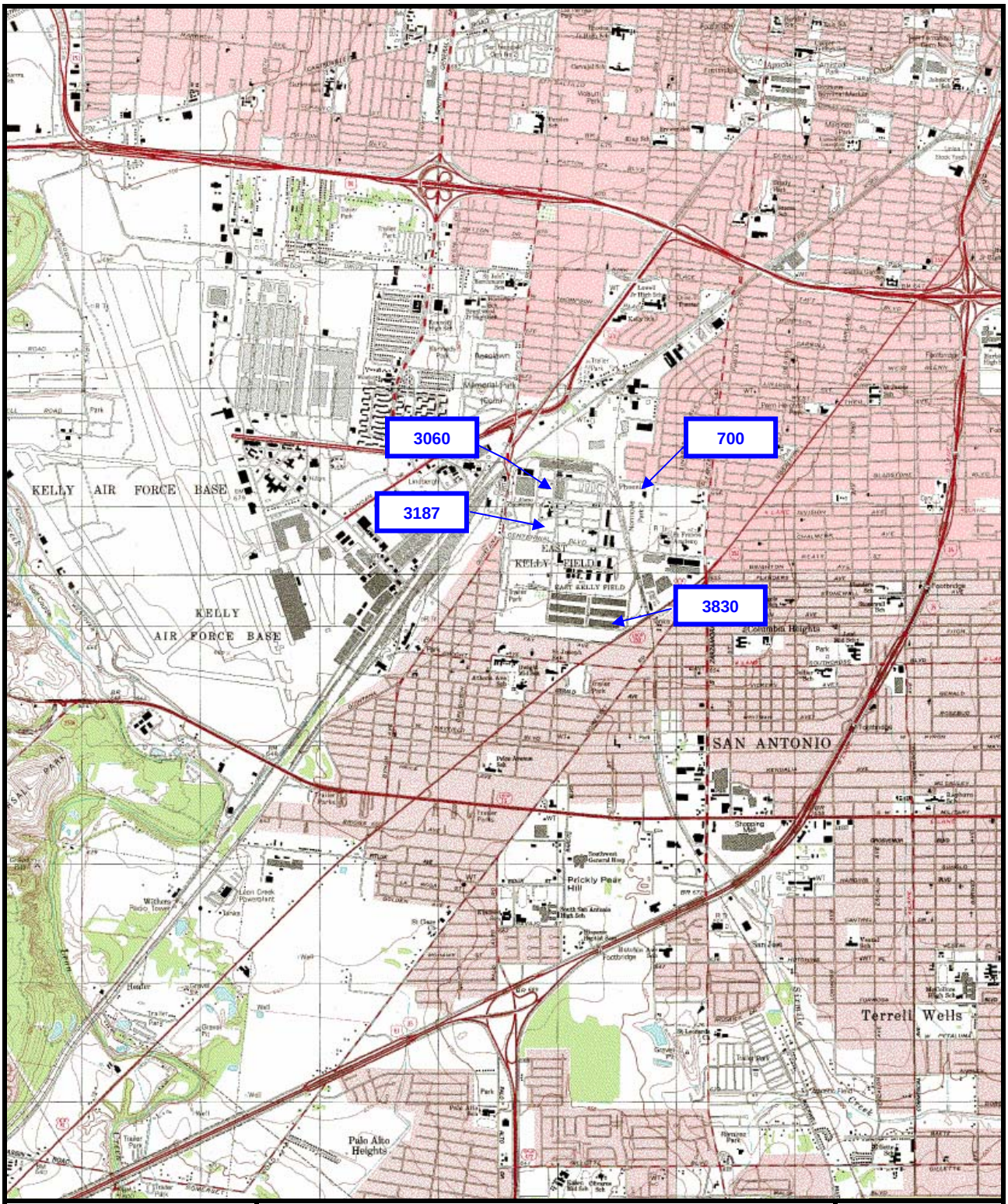
Photo 3 – Sample 3830-2 collecting sample.

Photo 4 – Completing COC at Bldg. 3187.

Photo 5 – Measuring slab at Bldg. 3830.

Photo 6 – Grouted holes at Bldg. 700.

ATTACHMENT E
MONITORING LOCATIONS MAP



zephyr environmental corporation

Scale: 1" = 1100'

N

MONITORING LOCATIONS MAP
OCTOBER 2004 SOIL VAPOR MONITORING
EAST KELLY AFB

USGS TOPOGRAPHIC MAP
(Terrell Wells 7.5 min Series)

ATTACHMENT
E